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JOB COMPLETION REPORT

INVESTIGATIONS PROJECT

State of Montana

Project No.: W-49-R-9 Name Fur Resources and Predator Surveys and Investigations

Job No.: IV-A Title Black Bear Population Studies

Period Covered: May 1, 1959 through April 30, 1960

Abstract:

A comprehensive study of the black bear was begun in June, 1959. The study area was centered in the Big Creek drainage north of Whitefish, Montana. After experimenting with succinylcholine chloride on captive bear from Yellowstone Park, live-trapping of bear was begun on the study area. Live-trapping, handling, and marking techniques were developed as the bear were captured and by a literature review. During the trapping period from June 15 through November 5, 1,633 trap units were set resulting in the capture of 42 black bear and 2 grizzly bear. Eight of the black bear captures were of previously captured animals. Three additional bear were captured free-ranging with the aid of a dart gun and succinylcholine chloride. Observations of bear were made throughout the study area and period. Observations were made of 72 bear by members of the trapping crew and 46 were reported by loggers or Forest Service personnel. Forty-two of the observations were of known animals or known family groups. Maps and aerial photos of the area have been obtained and capture and observation data have been recorded on them.

In the food study phase, a total of 440 scats have been collected. Six plots have been established on the study area to sample huckleberry production. A four mile transect was run through a portion of the whitebark pine stand on the area, and ten trees have been sampled and marked permanently for future comparison. Lower on the study area, 200 cambium wounds have been examined, measured, aged, and recorded.

The use of succinylcholine chloride as an agent in immobilizing bear was thoroughly investigated. Effective dosages for handling bear of estimated weights were found to be in the vicinity of 1 mg./4 to 5 pounds of body weight. The maximum and minimum effective dosages used were 1 mg./10 pounds of body weight and 1 mg./2.8 pounds of body weight. Safe dosages for reimmobilization of partially recovered bear were found to be five to ten mgs., dependent on the bear's rate of recovery and size.

A considerable amount of general life history information has been gathered on the bear, but much of it will not be meaningful until larger samples have been obtained.

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The bear study should be continued through 1960 as an intense project. Follow-up work on a part time basis should continue for five or more years.

Objectives:

To obtain biological and ecological information.
To refine live-trapping, handling, and marking techniques.

Techniques Used:

Experiments were conducted on wild bear obtained from Yellowstone Park to determine the effectiveness and limits of succinylcholine chloride (Sucostrin--Squibb*) as an intramuscular paralytic drug. Preliminary maximum and minimum dosages were determined by giving a series of increasingly larger dosages to these captive bear. These dosages were then applied in the field and substantiated or corrected.

The range, accuracy , and rapidity of action of the carbon dioxide powered long range syringe projector (Cap-Chur Gun, Palmer Chemical Co., Inc., Atlanta, Georgia) and automatic projectile syringe used in the study were also tested on the experimental animals.

The Big Creek drainage in the Whitefish Mountains north of Whitefish, Montana, was selected as a study area on the basis of accessibility and bear density. The area was inspected from the ground and Forest Service maps. Aerial photos and planemetric maps of the area were obtained.

Bear were live-trapped with the aid of modified Newhouse 150N steel traps with offset jaws and the teeth removed. Cubby and bank sets were constructed throughout the study area, and the bears were lured in with bait and scent. Some free-ranging bear were captured with the aid of the dart gun.

Because of its great latitude of action and safety, succinylcholine chloride was the only drug used in handling the bear. Initial dosages were administered with the aid of the dart gun, and subsequent dosages were given with the aid of a hypodermic syringe. Some of the smaller cubs were handled without the aid of the drug.

A series of measurements were recorded for each animal. Direct measurements were made of the teeth, pads, mammae, and vulva. Measurements by palpation were made of the sagittal crest, bacculum, and testes.

All animals were marked in one or several ways. Metal stock tags that varied by number and color were placed in the ears of all bear. A distinguishing number was tattooed in the tip of each ear and on some bear beneath the right foreleg. Vinyl tape ribbons (Craighead and Stockstad, Unpub.) were placed in the ears of some bear and riveted. Leather collars and a small cowbell were attached around the necks of three bear. Natural markings were utilized whenever possible.

*Supplied by the Squibb Institue for Medical Research, New Brunswick, New Jersey.

All bear were weighed with spring scales. Cubs were weighed in the trap or by hooking a foot on the scale hook. Larger bear were rolled onto a mantie, the corners of the mantie hooked in the scale hook, and both bear and mantie lifted manually or with the aid of a pole tripod and block and tackle.

The bear were guarded against injury as much as possible. Traps were checked twice a day or more so the animals captured would not spend too long a time in the trap; all bear were given an intramuscular antibiotic (penicilin and streptomycin), and all cuts and skin abrasions were treated with a strong antiseptic. At least one member of the trapping crew remained with every drugged bear until the bear was able to stand on its feet and move off. Immobilized bear were covered with a tarp during inclement weather.

In cooperation with Montana State University, carcasses of accidently killed bear, experimental bear, and any other carcasses were cleaned for future aging criteria. When a sufficient quantity of bear are accumulated, the skulls and long bones, especially, will be used in correlation with weight and the measurements mentioned above to develop accurate aging techniques. Measurements of known age bear from this study will be integrated with this material.

Information on movement and den sites was obtained by tracking and backtracking bear in early fall snow. More attempts at tracking will be made in early spring as the bear first start to move around.

Observations of bear in the area were made with the aid of field glasses and a spotting scope. The locations of all observed tagged or naturally marked animals were recorded on aerial photos. Feeding movements and general habits were noted. The estimated weights, description, and general location of all bear were recorded. Observations made by loggers and Forest Service personnel in the area were also recorded.

Scats of bear were collected from a network of trails and roads in the area for the food study phase. Trails giving a good representative sample of all types of habitat and of all elevations in the Big Creek drainage were cleared of bear scats as soon as the snow melted back in the spring and early summer. From that time on, the routes were covered periodically, and all scats collected until snow made this impossible in the fall. The scats were dried and stored for analysis.

Sample transects were established to compare available foods with foods consumed by bear. Four permanent huckleberry transects were established at the 5,000 foot elevation, each representing a different exposure, one at the 5,800 foot level with a south exposure, and one at the 6,600 foot level with a south exposure. A four mile transect was run through the whitebark pine stand with trees sampled at 100 pace intervals. Also, 10 whitebark pines were permanently marked along this transect. The total number of 1959 cones on all trees were counted with the aid of a spotting scope. Production will be compared with future years. At the 5,000 to 6,000 foot elevation,

cambium wounds were sampled along a trail. The species of the tree, the length of the wound, the percent girdled, and the age of the wound were recorded for all trees.

Findings:

Live-trapping Program

The results of bear live-trapping are presented in Table 1. Although 47 captures of bear were made, only 39 bear were involved with 8 being re-captures. Forty-four of the bear were captured with the aid of steel traps. To effect these captures, 1,633 trap units were set, giving a trapping success of 2.7% or one capture for every 39 trap units. Three bear were captured away from any trap by chasing the cubs into trees and shooting the female with the paralytic drug.

TABLE 1

BEAR LIVE-TRAPPING RESULTS FOR 1959

Animals Captured	Number of Caps		Ave. Weights	
	Male	Female	Male	Female
Black bear				
Cubs	3	7	28	31
Yearlings	7	5	63	78
Adults	7	15	157	145
Total	17	27	96	103
Grizzly bear				
Adults	2	0	255	0
Wolverine	1	0	32	0

Trapping, marking, and handling techniques were based on methods described in the literature. These were expanded to meet the needs of the study area and the study. It was found that the best way to mark a bear is to mark it in as many varied ways as possible and in conjunction with natural markings. The markings used to date are summarized in Table 2.

TABLE 2

NATURAL AND ARTIFICIAL MARKINGS UTILIZED TO IDENTIFY WILD BLACK BEAR

Animals	Ear Tags	Tattoo	Ear Ribbon	Cow Bell	Scars
Black bear					
Brown phase	12*	10*	1	1	0
Black phase	25*	24*	11*	3*	1
Grizzly bear	2	2	0	0	0
Wolverine	1	0	0	0	0

* One animal died

Members of the trapping crew made 72 observations of bear and 46 observations were reported by loggers and Forest Service personnel working in the area. Forty-two of the observations were of marked or naturally marked animals or family groups.

Food Study

A total of 440 scats have been collected from roads and trails in the area. These scats were air-dried to prevent decomposition and are being analyzed at the present time by Ed Tisch, a graduate student at M. S. U., who is doing a food habits study on the black bear under Dr. P. L. Wright and this project.

Tisch established six huckleberry plots on the study area to sample the huckleberry production. The results from these plots are presented in Table 3. The plots will be sampled again in 1960 and the production for the two years compared.

TABLE 3

SUMMARY OF DATA COLLECTED IN SIX HUCKLEBERRY PLOTS TO ESTABLISH AN INDEX TO BERRY PRODUCTION IN 1959

Plot & Species	Number of Bushes	Average No. of Berries	Average No. of Ripe Berries	Average Size of Ripe Berries
Plot A.				
V. mem	24	5	0.4	9 mm
V. sco.	21	1	0.6	3 mm
Plot B				
V. mem.	28	5	1.6	9 mm
Plot C				
V. mem.	38	10	5.2	8 mm
Plot D				
V. mem.	40	2	0.5	7 mm
Plot E				
V. mem.	40	7	0.7	6 mm
V. sco.	18	2	0.7	3 mm
Plot F				
V. mem.	62	10	0.0	-
V. sco.	8	7	0.9	4 mm

A four mile transect through whitebark pine stands on the area and a small number of marked trees were used to sample the cone production. Table 4 summarizes the results.

Tisch examined and recorded data on 200 cambium wounds to formulate an index of the use of cambium by bear. This is primarily a biological rather than an economic evaluation. The results are presented in Table 5. Additional trees will be sampled in the spruce-fir zone to obtain a larger sample of these species.

TABLE 4

SUMMARY OF THE WHITEBARK PINE CONE PRODUCTION
ON SAMPLE TREES FOR 1959

Sample	Number of Trees	Ave. Number of Cones
Four mile transect	103	7.1
Marked trees	10	4.9

TABLE 5

USE OF CAMBIUM BY BEARS AS WITNESS BY DAMAGE
TO TREES ON STUDY AREA

Species of tree	Sample size	Ave. DBH	Ave. age of wound	Ave. lgth. of wound
Alpine fir	2	8.5"	7	46.5"
Larch	1	4	dead	24
Lodge pole pine	198	6	14	45

Use of Succinylcholine Chloride

Succinylcholine chloride was used very successfully in immobilizing black bear. The practicality of the drug was first tested on experimental bear held in captivity. The results, shown in Table 6, demonstrated that the drug would be adequate for the purpose of this study. These data were then applied in the field and substantiated or corrected by administering doses in the proximity of 1 mg./5 pounds of estimated body weight. The complete data collected in the field are presented in Table 7.

Single doses that were effective in attaining immobilization of bear in the field ranged from 1 mg./8.8 up to 2.8 pounds of body weight and averaged 1 mg./4.5 pounds of body weight (see Table 8). If the initial dosage given an individual was not sufficient, considerably more drug was required to produce immobilization.

TABLE 6

SUMMARY OF EXPERIMENTS WITH SUCCINYLCHOLINE CHLORIDE ON CAPTIVE WILD BLACK BEAR DURING MAY AND JUNE, 1959

Bear	Dose in mgs.	T* i m e	Lbs. per mg.	Time in minutes to: Effects First	Effects Full	Recovery First	Recovery Full	Period immobilized	Remarks
Male,	6		28.3	None					
adult,	15	25	11.3	10	None				Cut bone plug
170 lbs.	25	60	6.8	5	12	26	32	14	Given Vetame tran
	20	2 days	8.5	3	5	18	36	13	
	17	1 "	10.0	3½	5	12	23	7	
	20	1 "	8.5	4	12	17	22	5	
	50	3 "	3.4	1	1½	17	-	15½	
	30	17	5.7	-	-	-	-	2	
	80	19	2.1	-	0	-	-	5	Dead at 24 min.
Male,	40		5.2	3	7	25	32+	19	Given Vetame tran
adult,	40	2 days	5.2	1	2	8	18	6	
210 lbs.	21	1 "	10.0	4	7	12	27	5	
	30	1 "	7.0	4	7	22	60+	15	700 mg. Vetame tran. at 7 min.
	80	3 "	2.6	2	4½	-	-	11	Dead at 11 min.
Female,	30		5.0	3	4½	11	20+	6½	Free-ranging
adult,	30	12 hrs.	5.0	4	6	15	-	9	
150 lbs.	30	15	5.0	-	16	26	-	10	
	80	26	1.9	-	-	-	-	9	Dead at 35 min.
Male, yrlg.	10		6.0	3	-	-	10	-	Free-ranging, never well out.
60 lbs. approx.	15	10 hrs.	4.0	-	-	-	-	-	Not time, never well out, free-ranging.

*Time in minutes from previous injection.
-Means results, but time not recorded.
All times are from injection (0 minutes); first effects are slight salivation and eye-blinking or drooping of head; period immobilized is the time in minutes from full effects (animal is completely safe to handle) to first recovery (animal begins to be dangerous as jaw and/or paw movements become stronger); full recovery is when the animal stands up.

TABLE 7

RESULTS OF ADMINISTERING DOSES OF SUCCINYLCHOLINE CHLORIDE
TO CAPTURED AND FREE-RANGING BEAR IN THE FIELD

No.	Sex	Wt.	Dose in mgs.	Time*	Lbs. per mg.	Total**	Time in minutes to: Effects First	Effects Full	Recovery First	Recovery Full	Period immobilized	Remarks
1	F	130	30		4.3		6	6½	12½	18	6	
2	F	105	18		5.8		3½	6	-***	None	(3	
			15	9	7.0	3.2	1	2	11	14	12)	Artificial respiration
3	M	105	25		4.2		3	4½	10½	None	(6	
			10	11	10.5	3.0	-	-	17½	28	18)	Artificial respiration
4	F	70	25		2.8		1½	2½	9	30	6½	
5	F	155	25		6.2		2½	None				
			35	14	4.4	2.3	3	5	10	41	5	Drug weak?
6	F	155	25		6.2		None					
			25	10	6.2	3.1	6	None				
			20	2-7	7.8	2.2	None					
			35	44	4.4	1.5	4	None				Died at 64 minutes
			35	59	4.4	1.1	3	5	Dead		5	
7	M	163	37		4.4		2½	3	11½	29½	8½	
8	M	128	20		6.4		3	4	12	21	8	Never well immobilized
9	M	40	8		5.0		1	1½	7½	15½	6	Never well immobilized
10	M	58	10		5.8		2½	3	7	11	4	Never well immobilized
11	F	80	20		4.0		1½	8	-	None	(5	
			8	13	10.0	2.9	-	1	4½	21½	9)	

TABLE 7 CONTINUED

No.	Sex	Wt.	Dose in mgs.	Time*	Lbs. per mg.	Total**	Time in minutes to: Effects First	Effects Full	Recovery First	Recovery Full	Period immobilized	Remarks
12	M	68	18		3.8		6	None				In testicle
			20	49	3.4	1.8	4	7	22	26	15	
13	F	125	35		3.6		3	9	18	28	9	
14	F	150	30		5.0		1	8	-	None	(4	
			7	12	21.4	4.6	-	-	22	29	10)	
15	F	25	7		3.6		4	-	5	None	(2	
			5	7	5.0	2.1	-	-	9	18	10)	Never well immobilized
16	F	25	8		3.1		None					Free-ranging
			7	1 day	3.6		3½	-	-	7½	4	Never well immobilized
17	F	128	30		4.3		9	None				
			8	12	16.0	3.4	-	-	16	21	16	Never well immobilized
18	F	53	15		3.5		None(?)					
			15	9	3.5	1.8	2½	3½	8	16	4½	
19	M	175	30		5.8		4	7½	10	None	(2½	Dropped at 30 sec.
			10	11	17.5	4.4	1½	-	-	"	3	for 30 sec.
			8	15½	21.9	3.6	-	-	-		5½)	Nerve?
			10	18½	17.5	3.0	-	-	4½	-	(4	
			10	24½	17.5	2.6	-	1½	7½	9	6)	
20	F	140	30		4.7		None					
			35	22	4.0	2.1	5	None				
			10	48½	14.0	1.9	4½	7½	-	None		
			15	70	9.3	1.6	1	-	2½	15		

TABLE 7 CONTINUED

No.	Sex	Wt.	Dose in mgs.	Time*	Lbs. per mg.	Total**	Time in minutes to: Effects First	Effects Full	Recovery First	Recovery Full	Period immobilized	Remarks
21	F	141	35		4.0		2	3	14	21	11½	
22	F	135	20		6.8		None					
			20	22	6.8	3.4	"					
			25	43	5.4	2.1	"					
			30	73	4.5	1.4	3	4	15	-	11	
23	M	160	43		3.7		1½	3	16	None	13	
			15	16½	10.6	2.7	None				( )	Subcutaneous,
			15	18	10.6	2.2	2½	6½	21½	Dead	15	Dead at 37 minutes
24	F	140	30		4.7		None				)	
			30	28	4.7	2.3	None				)	
			40	1 day	3.5		28	None			)	Syringe malfunction
			10	30	14.0	2.8	None				)	
			10	39	14.0	2.3	-	1	20	125	19)	
25	F	200	32		6.2		None					
			10	11	20.0	4.8	"					
			20	27	10.0	3.2	"					
			30	64	6.2	2.1	14	None				Dart fell out
			5		40.0	2.1	-	21	None			? From 30 mg. injection
			10	105	20.0	1.9	-	-	"			
			10	114	20.0	1.8	-	-	"			
			15	128	13.3	1.5	-	-	29	124	60	
26	M	58	15		3.9		None					
			5	18	11.6	2.9	3	None				
			5	25	11.6	2.3	-	2	10	17	8	All times approx.

TABLE 7 CONTINUED

No.	Sex	Wt.	Dose in mgs.	Time*	Lbs. per mg.	Total**	Time in minutes to: Effects First	Effects Full	Recovery First	Recovery Full	Period immobilized	Remarks
27	F	152	25		6.1		None					
			15	15	10.1	3.8	7	None				
			5	23	30.4	3.4	-	1	None		(5	
			5	29	30.4	3.0	-	-	14	80?	14)	Time approx.
28	M	79	23?		3.4?		2	3	8	None		Syringe malfunction
			5	8	15.8	2.8	-	-	-	32	5+	" "
29	F	97	22		4.4		11	None				
			5	14	19.4	3.6	-	2	None		(3	
			5	19	19.4	3.0	-	-	10	-	10)	
30	M	230	40		5.8		6	8	17	None	(9	
			10	18	23.0	4.6	-	-	8	20	9)	
31	M	78	20		3.9		7	None				
			5	10	15.6	3.1	-	1	18	-	17	
32	F	172	40		4.3		6	7	24	44	17	
33	F	40	10		4.0		½	½	20	62	19½	Needle cut Bone plug.
34	F	152	32		4.8		5	None				
			10	19	15.2	3.6	-	"				
			10	28	15.2	2.9	-	"				
			10	33	15.2	2.4	-	"				
			10	41	15.2	2.1	-	"				
			10	43	15.2	1.9	-	5	25	30	20	
35	F	29	10		2.9		-	2	-	-	(10	Times approx.,
			5	30	5.8	1.9	-	1	-	-	10)	free-ranging

TABLE 7 CONTINUED

No.	Sex	Wt.	Dose in mgs.	Time*	Lbs. per mg.	Total**	Time in minutes to: Effects First	Effects Full	Recovery First	Recovery Full	Period immobilized	Remarks
36	F	140	34		4.1		-	-	-	-		Times approx.,
			5	30	28.0	3.6	-	-	-	-	30	free-ranging
37	M	44	10		4.4		-	-	-	-	15	" "
38	F	88	10		8.8		6	8	-	-	10	Times approx.
39	M	60	15		4.0		3	6	26	34	20	
40	M	320	85		3.8		5	8	26	30	18	Grizzly bear
41	M	190	50?		3.8?		None					Grizzly bear, may have
			60	41	3.2	1.7	"					gotten only 20 mg.
			40	67	4.8	1.3	4	None				
			20	83	9.4	1.1	-	"				
			20	96	9.4	1.0	-	"				
			30	110	6.4	.9	3	5	22	None	17	
			10	?	19.0	.8	-	-	-	44		
42	M	32	7		4.6		4	None				Wolverine, never
			4	4	8.0	2.9	-	2	14	19	15	well immobilized

*Time in minutes from initial dosage.
**Mgs. per pound with total dosages.
***Results, but time not recorded.

The period of immobilization and the recovery rates were also affected when the initial dosage was not adequate and more drug was given. As shown in Table 8, the period of immobilization was doubled when immobilization was achieved by a series of inadequate injections.

TABLE 8

SUMMARY OF SUCCINYLCHOLINE CHLORIDE DOSAGES GIVEN TO BEAR OF ESTIMATED WEIGHTS IN THE FIELD

Application of drug	Pounds per milligram for: 1st effect		Full effect		Period immobilized	
	Ave.	Range	Ave.	Range	Ave.	Range
1 dosage	4.5	2.8-8.8	4.5	2.8-8.8	9	3-20
2 dosages	2.7	1.8-3.8	2.6	1.8-3.6	14	3-30
3 dosages or more	1.8	1.4-2.1	2.1	1.1-3.4	20	5-60

Table 9, which presents the average time in minutes to effects and recovery, shows that bear immobilized with a single adequate dosage exhibited full recovery in approximately one-half hour, but that recovery was slowed to an average of 70 minutes by a series of three or more inadequate doses.

TABLE 9

THE TIME IN MINUTES TO EFFECTS AND RECOVERY AFTER ADMINISTRATION OF SUCCINYLCHOLINE CHLORIDE TO BEAR IN THE FIELD

	Time in minutes to:*					
	Effects		Recovery		Recovery after 3+ doses**	
	First	Full	First	Full	First	Full
Average	3	5	13	27	25	70
Range	.5-6	.5-9	5-26	7.5-62	10-72	17-167
Sample Size	22	21	17	12	8	7

* All times determined from time of injection.
** Times determined from first dose to produce full effects.

A small dosage of five to ten milligrams of succinylcholine chloride (dependent on the bear's recovery and size) was found sufficient to extend the period of immobility or to reimmobilize an animal shortly after first recovery (see Table 10).

TABLE 10

SUMMARY OF DOSAGES REQUIRED TO REIMMOBILIZE BEAR AFTER EFFECTS OF FIRST DOSAGE BEGIN TO SUBSIDE

Bear	Dosage in mgs. req. to immobilize	Period immobilized in min.	Dosage in mgs. given to return animal to full effects	Period immobilized in min.
27, *female, adult, 152 lbs.	25 + 20	5	5	14
29, female, yrlg., 97 lbs.	22 + 5	3	5	10
15, female, cub, 25 lbs.	7	2	5	10
14, female, adult, 150 lbs.	30	4	7	10
11, female, yrlg., 80 lbs.	20	5	8	9
30, male, adult, 230 lbs.	40	9	10	9
3, male, sub-adult, 105 lbs.	25	6	10	18
2, female, sub-adult, 105 lbs.	18	3	15	12
Female**, adult, 150 lbs.	30	9	30	10

* Bear number from Table 2.
**Bear number 3 on Table 1.

There does not seem to be any significant difference in the amount of drug per pound of body weight that small bear require as compared to larger black bear, but bear captured in the fall with a higher ratio of fat to muscle seem to require smaller amounts of the drug per pound of body weight (see Table 11). Eleven bear were given the same average dosage in the fall period as 11 different bear received in the spring and early summer period, but the fall bear were immobilized twice as long.

TABLE 11

DOSAGES AND PERIODS IMMOBILIZED FOR BEAR OF DIFFERENT WEIGHT AND FOR BEAR HANDLED IN THE SPRING VERSUS BEAR HANDLED IN THE FALL

Weight or period	Ave. wt.	Sample size	Average lbs. per mg.	Range in lbs. per mg.	Average period immobilized
0-60 lbs.	44	6	4.7	3.6-5.8	8 min.
61-120 lbs.	88	6	4.8	2.8-8.8	6 min.
121-230 lbs.	157	10	4.8	3.6-6.4	9 min.
June-July	105	11	4.7	2.8-6.4	6 min.
Aug.-Nov.	110	11	4.7	3.6-8.8	11 min.

Two grizzly bear were handled during this study with the aid of succinylcholine chloride (#40 and 41, Table 7). Data from these two animals indicates the dosage for grizzly bear to be comparable to the dosage for black bear.

Sucostrin was administered to one wolverine in the course of this study and since the animal was successfully handled, the results are reported here (42, Table 7). It appears that to properly immobilize a wolverine for handling, they should be given a somewhat stronger dosage than the average for a black bear, probably about 1 mg./3 pounds of body weight.

Two black bear died accidentally from the action of the drug and three were sacrificed for experimental purposes.

Ecology and Physiology

Considerable amounts of data have been collected on various aspects of bear life history, but much of it will not be meaningful until larger samples have been obtained. Some of the items on which data have been collected are reproductive capacity, breeding age, yearly breeding habits, development of mammae, sex and age composition, rate of gain, hunting pressure, grizzly and black bear relationships, and hibernation.

Discussion:

Live-trapping Program

The progress of the study through 1959 was considered quite successful, although the live-trapping program was slowed considerably during 1959 for two reasons; (1) trapping operations did not get started until the middle of June, two weeks after I was employed by the State for this job; (2) live-trapping was begun with only eight traps. Until the 20th of July, when 25 more traps were received, only a very short trap-line could be set. Through June, July, and the first part of August many more bear were seen along the roads and low in the stream valleys. Since trapping success was also much higher during these periods, it is believed that many more bear could have been captured with an adequate number of traps.

One adult female black bear was captured three times during the 1959 season. Most bear, however, show some degree of trap shyness after the first capture. For this reason, every effort is being made to mark thoroughly and effectively each animal at the time of first capture. After the first capture, the study will be benefited by a definite observation of a marked bear almost as much as by a recapture of that bear.

Two bear were injured noticeably by the steel traps. One yearling broke the radius of the left front leg. The bear was recaptured later and the bone had knit. A second yearling seriously injured its right rear foot. This bear was caught during a snow storm and the guide sticks around the trap did not guide the bear to place its foot in the trap properly. This bear chewed part of its toes off in an attempt to escape. She was not recaptured so recovery could not be confirmed. Considering that 47 bear captures were made with the steel trap, this is a rate of 4% of serious injury. I do not believe this will significantly affect the study.

Food Study

Ideally, the scats should be analyzed in the field as they are collected. During 1959, this could not be accomplished since there were neither adequate facilities nor sufficient personnel available. Air-drying and storing of the scats hampers identification of materials in the scats, since plant materials loose their original color. During 1960 scats will be analyzed as soon after collection as possible.

The huckleberry and whitebark pine transects will give an index to the production of the berries and cones. If there is no great change in the production during the 1960 season, the information on the relationship of these foods to bear that is gained during the period Tisch works on the food study will be limited. From general observations, the 1959 season did not produce either a good huckleberry crop or a good whitebark cone crop. Huckleberries were plentiful in a narrow band around the 5,000 foot level, but the crop was not extended over a long period of time at different elevations as is found on a good huckleberry year. To clearly show the relationship of these foods to bear, scats should be analyzed on both a poor and a good huckleberry and cone year. Tisch will be able to demonstrate the foods used in comparison to the foods available.

The survey of use of cambium by bear is designed to show what periods of the year bear do this feeding, what species are preferred in this area, the size class preferred, and whether cambium use is cyclic. While an economic evaluation of this damage may be more useful in management of the forests, this study is designed to determine the feeding habits of the bear. An economic evaluation will therefore be left to a future study.

Use of Succinylcholine Chloride

The use of succinylcholine chloride in handling bear has been very successful. Although other drugs including anesthetics could be used for the same work, sucostrin has proved ideal for the period of immobility required and for administration to bear of unknown weights. The average dosage given to bear in the field was 1 mg./4.5 pounds of body weight, but this average does not represent the dosage necessary for a maximum period of immobility, since dosages were purposely made less potent than the estimated maximum to allow for errors in weight estimation. Conversely, the average dose necessary for adequate immobilization would be lower than 1 mg./4.5 pounds of body weight and dosages should be lowered if absolutely safe limits are desired. However, although an overdose would be less likely, more bear would need supplemental doses. The time involved in the examination and handling of immobilized bear during this study averaged 10 to 15 minutes. For similar time requirements, a dosage of 1 mg./4 or 5 pounds of body weight should be sufficient, since dosages in this range gave an average of 13 minutes immobility. If longer periods of immobility are desired, it would probably be better to apply the supplemental dosage of 5 to 10 mgs. as required, rather than risk an overdose with larger initial doses. The average lethal dosage for two accidentally and three experimentally killed animals was 1 mg./2.0 pounds of body weight (range, 1.1 to 2.6 pounds of body weight). If very long periods of immobility are desired, an anesthetic such as pentobarbital sodium may be more desirable . This drug has been used extensively on black bear by Black (1958). However, a considerable degree of safety and versatility of any drug lies in the proficiency of the user.

Three minutes, the average period to first effects as shown in Table 9, limits the use of the drug on free-ranging animals. It was used successfully on seven free-ranging bear, but five of these were treed cubs or yearlings and the remaining two were females who stayed near cubs or yearlings that were in trees. The method should work well with "good tracking" conditions, since the only problem involved is finding the animal before it recovers from the effects of the drug.

The abnormal reactions to the drug that have been listed above could result from numerous causes. The most obvious causes are; (1) a differing rate of absorption into the blood stream dependent on the site of injection and the amount of fat present, (2) increased gradual absorption of residual drug when there are numerous injections sites, (3) a lowering of the resistance to the drug when administered for long periods of time, (4) a slowing of the hydrolyzation rate when the drug is administered for long periods of time, (5) individual

physiological reaction to the drug, (6) changes in the potency of the drug under adverse field conditions, and (7) occasional malfunction of the automatic syringe.

Recommendations:

Live-trapping and marking of bear should be carried on extensively throughout 1960 and on a part time basis for four or five years after. An attempt should be made to tag every bear that frequents Big Creek drainage and determine the residential status of each bear. Live-trapping and observations should be extended to surrounding areas when time permits. New marking devices should be devised.

Transects should be established along logging roads seeded with grasses and forbs to determine the extent of use by species. Sections of logging roads should be seeded in cooperation with the Forest Service to determine the use of overgrown roads as compared to graded roads. The possibility of a chemical analysis, physiological, and ecological study of the huckleberry as a fruit bearing plant and a browse species should be investigated.

Data on the use of sucostrin chloride in immobilizing bear should be substantiated with further information.

Bear should be tracked in the snow during spring and fall periods to find more hibernating sites. Hibernating bear should be observed to determine the mortality rates during hibernation.

Bear seasons in Montana should be made more liberal by allowing hunting with dogs, by baiting, and by shooting cubs in the fall. If none of these methods are feasible, more people should be educated to utilize bear as a game animal. Of the 37 black bear tagged and released on Big Creek, only one was shot by a hunter.

Literature Cited:

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